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关于云南早泥盆世胴甲鱼类的初步报告[1)]

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摘 要

本文记述了云南早泥盆世胴甲鱼类中与云南鱼（*Yunnanolepis*）接近的一个新种类。它在感觉沟系统、颊部骨片、特别在肩带、肩关节和胸鳍等方面与一般胴甲类不同。它不具一般胴甲类的肢突、腋窝和腋孔，而具一深的漏斗状胸窝。一些标本的肩带具分立的内侧片和胸棘片。这些特点为胴甲类起源于泥盆纪以前的某些有棘类真节甲鱼的假设提供了佐证。文中提出已知胴甲类应分为两个主要类群，其中一个类群包括云南鱼及与之有关的种类，另一类群包括其余各属。

前 言

在近几十年来云南早泥盆世发现的大量脊椎动物化石中，刘玉海（1963）曾记述了一个新的胴甲鱼类—计氏云南鱼（*Yunnanolepis chii*）。本文记述的其他云南早泥盆世胴甲类化石代表另一新的种类。这一新的种类可能与计氏云南鱼接近，但由于尚未完全了解清楚，其隶属关系尚不能最后确定。本文中仅使用标本登记号记述各个标本[2)]。

描 述

这一新的胴甲鱼类表面上与已知种类颇为相似，但进一步观察发现二者有以下许多重要差别。

1. 前中片

一般胴甲类前中片背面（插图 2b）略凸起并向前方微倾，但在头甲保存完好的 V4424.3 号标本上，此面由两部分组成（图 1d），后部凹陷，指向后上方，前部略凸起，指向前上方。两部沿一截面略呈三角形的横脊相接并均具纹饰。如在桨鳞鱼（*Remigolepis*）以及其他某些一般胴甲类中一样，这一新的种类不具眶前凹（preorbital recess）。有趣的是，

1) 本文于 1966 年在瑞典自然历史博物馆成稿。文章被延误十余年后，现按原稿发表。因此文中引用的参考文献截止于 1966 年。中文稿系英文原稿的译文。

2) V4424.3 号和 V4424.5 号标本后被命名为小云南鱼，V4425.7 号标本命名为翠峰山长瘤鱼（见张国瑞，1978，古脊椎动物与古人类，**16**，3）。

V4424.3 号标本的前中片具一特殊的厚的腹中隔 (median ventral lamina, *r. spr*, 图版 I:2; 图 1c, d), 自前中片前缘中部向后伸达眶孔 (orbital fenestra) 最前部。此隔在现有标本中未完全暴露, 但似与前中片下面相连, 形成较宽的纵向中央骨质脊—下前中脊 (subpremedian ridge)。如下所述, 此脊可能代表鼻间壁 (internasal wall) 的前方延续部分, 因此由内骨骼组织构成。

2. 吻片

在 V4424.3 号标本中, 吻片 (*R*, 图版 I:1; II:1; 插图 1 a, e) 似由四个板 (laminae) 组成, 即背板、鼻间板、鼻下板和鼻前板(插图 1e)。背板具纹饰, 由外骨骼组成。其余三个板不具纹饰, 从其与鼻孔和鼻腔的相对位置推知, 可能属于内骨骼组织。只有背板 (dorsal lamina) 与大多数已知胴甲类中的吻片相应。鼻间板 (internasal lamina) 为两侧鼻腔后部

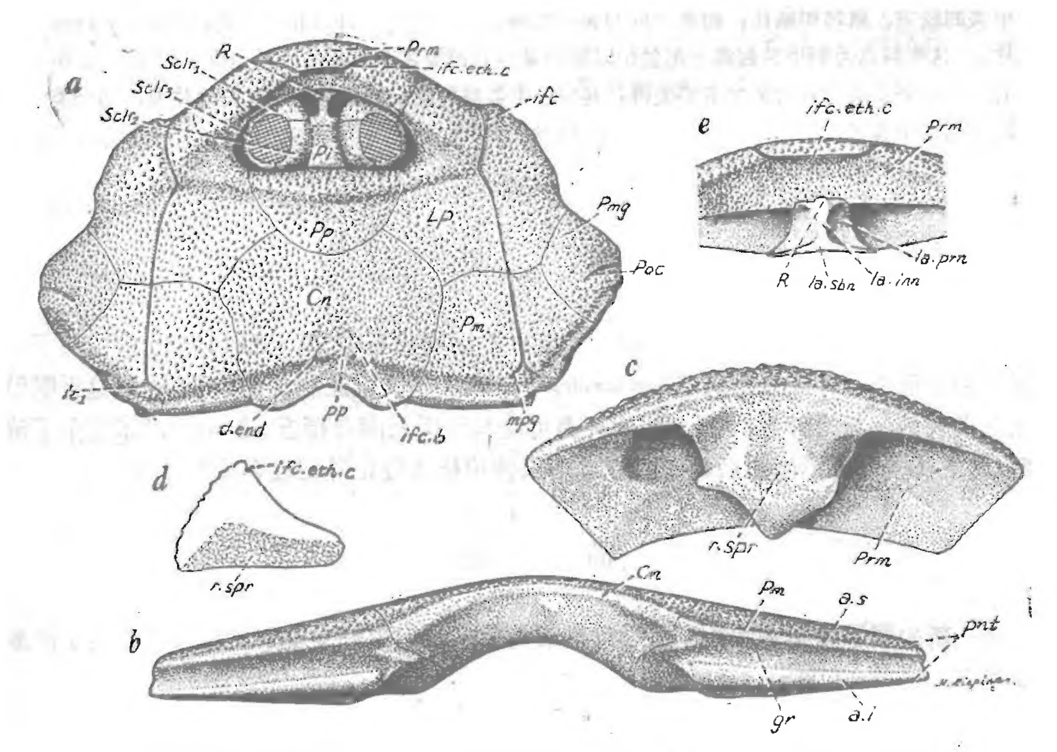


图 1. 云南胴甲鱼新种类: *a*, *b*, 头甲复原背视 (*a*) 及后视 (*b*); *c*, 前中片腹视; *d*, 前中片纵切面示意图; *e*, 吻片及前中片中部后视。

之间的一中位垂直构造, 因此实际上属于鼻间壁的后部。鼻下板 (subnasal lamina) 侧向伸达鼻间板两侧, 形成每侧鼻腔后部的底面, 因此鼻下板实际上是内颅筛区腹壁的一部分。鼻前板 (prenasal lamina) 形成吻片的前内部, 由于其位置横向, 在某种程度上构成鼻腔的前壁。但其侧向延伸程度不足以构成每侧鼻腔的完整前缘, 这种有限的侧向延伸似乎表明每侧鼻囊向前延伸并沿下前中脊两侧略向侧方延伸。因此, 下前中脊的位置说明它很可能代表鼻间壁的前部。总之, V4424.3 号标本的吻片无疑是由内骨骼和外骨骼共同组成的一复合骨片。由此可见, 吻片的鼻间板和鼻下板似乎共同代表沟鳞鱼 (*Bothrio-*

lepis）和桨鳞鱼中的Y形小骨片（Patten 1912, *é*, Fig. 253; Stensiö 1931, p. 27, 1948, pp. 25—26)。在沟鳞鱼和桨鳞鱼中，这一Y形内骨骼骨片与外骨骼吻片相分离，其发育程度远不及 V4424.3 号标本。因此，V4424.3 号标本似乎比沟鳞鱼或桨鳞鱼具有更为广泛的内颅骨化现象。

3. 头部感觉沟系统

V4424.3 号标本与已知胴甲类在头部感觉沟系统方面基本相近，但有以下一些例外。指向前上方的前中片背面前部具有向上并向后弯曲的沟，可能相当于两侧眶下感觉沟之间的筛联合感觉沟中部（*ifc. eth. c*, 图版 I:1;II:1; 插图 1a, e)。可见此感觉沟联合部在通过每侧的颏片(mental plate)后，向上伸达前中片，因此组成该片前中部的骨片成分应相当于 Rhenanida 的一系列吻部小骨片(Stensiö, 1969; *Sc.r*, Figs. 93—98)。在已知胴甲类中存在的眶下感觉沟的次生上眶下支(secondary, superior suborbital branch)，在 V4424.3 号标本中或者不存在或者占据一完全表面的部位。

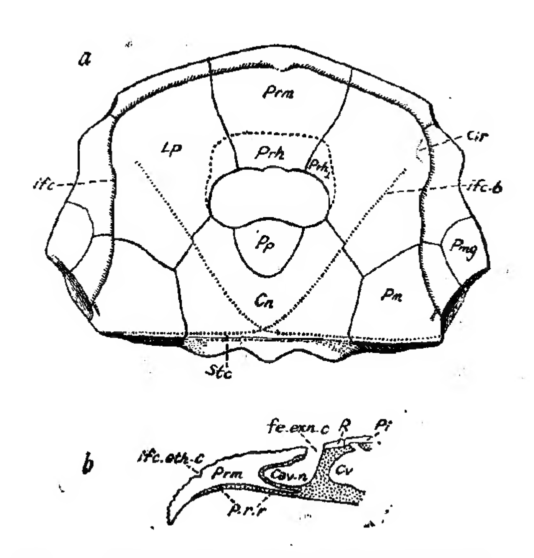


图 2. 加拿大沟鳞鱼（*Bothriolepis canadensis*）头甲复原背视（*a*）及前中片纵切面（*b*）；依 Stensiö 1948，图 9 及 1969，图 135B。

过去在中、晚泥盆世胴甲类中未见到前鳃盖感觉沟(插图 2a)，而 V4424.3 号标本却具有此沟（*poc*, 图版 I:1;III:1; 图 1a)。如在 Pachyosteomorphi, Dolichothoraci 和 Coccosteomorphi 中一样，此沟始自接近副颈片（paranuchal）和背前鳃盖片（dorsal preopercular "postmarginal"）之间的骨缝处，穿过背前鳃盖片向侧方和下方延伸。事实上，上述云南标本的前鳃盖感觉沟的位置和方向与 Stensiö 在大约 20 年前假想的复原情况相同（Stensiö 1947, Fig. 14B)。此沟的存在表明，胴甲类外骨骼颅顶后侧方的两对骨片，正如 Stensiö 所解释的那样，分别是副颈缘片（paranuchalo-marginal）和背前鳃盖片。

4. 颊部膜质骨

新的云南种类不具一般胴甲类的单个外侧片或鳃盖片(extralateral or opercular plate)。在 V4424.3 号标本上有一组三个骨片，其与颅顶的相对位置和所占据的区域均与沟鳞鱼中外侧片(鳃盖片)相同。此组骨片中前方的一个(*Sb*, 图版 I:2;III:1)可能相当于 Pachyosteomorphi, Coccosteomorphi 和 Dolichothoraci 的下眶片 (suborbital) 的最后部，其余二骨片 (*Pso*, 图版 I:2; III:1, *Sm*, 图版 III:1) 可能代表颊部膜质骨发育完全的真节甲类的后下眶片 (Postsuborbital, "ventral preopercular") 和下缘片 (submarginal, "internal", "middle preopercular")，但后二骨片间的大部分骨缝不清晰，因此可能有某种程度的愈合。

5. 颈关节

和其他胴甲类一样，新的云南种类每侧颈关节的外骨骼部分由外骨骼颅顶的一个滑车和外骨骼肩带的一个窝组成。滑车 (*pnt*, 图版 IV:1;图 1b) 沿副颈缘片的整个后缘延伸，呈水平位置，中端最高，侧端最低。滑车的明显特点是具一水平沟，将整个关节区分为上下两部 (*a. s*, *a. i. gr*, 图版 IV:1; 图 1b)。两部均由筛状骨 (cribriform bone) 组成，而分隔二部的沟的底部由一般的骨组织组成。与此不同，沟鳞鱼滑车的关节区实际上是一连续构造，而星鳞鱼 (*Asterolepis*) 中则被垂向和斜水平向的不规则的沟分为许多小的

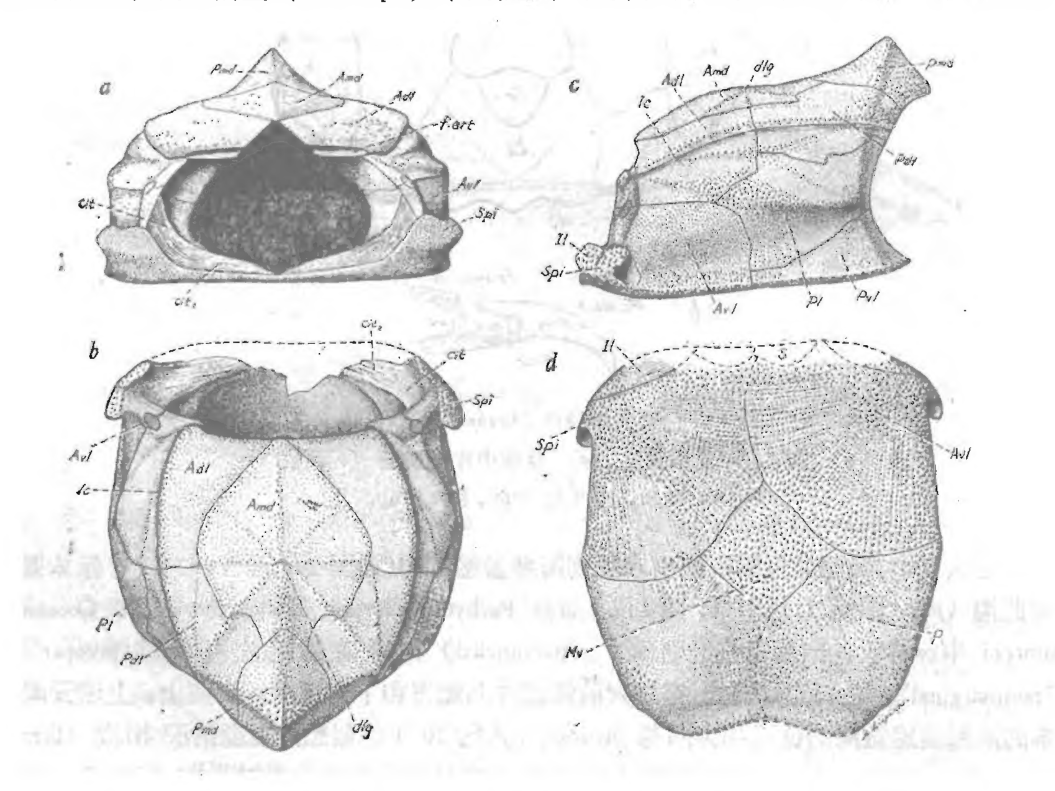


图 3. 云南胴甲鱼新种类的躯甲复原前视 (*a*), 背视 (*b*), 侧视 (*c*) 及腹视 (*d*)。

区域。云南标本的关节窝位于前背侧片前缘的通常位置上。由于此窝与滑车相对，其关

节区亦被一水平沟分为上下二部。

6. 肩带和胸鳍

云南标本的外骨骼肩带(图版 III:2—4；图 3a—d）属于中、晚泥盆世胴甲类的一般类型，但在 V4424.3 号、V4424.5 号和 V4424.20 号标本中可见分离的胸棘片（spinal plate）和内侧片（intero-lateral plate, "clavicle"）(*Il*, 图版 I:2；III:4；IV:2，3；V:2，3；插图 3d；4a—c)。胸棘片（*Spi*, 图版 III:2—4；IV:2—4；V:2；图 3a—d；4a—c）包括一通向外骨骼肩带内部的内腔（internal cavity），表明其中容纳了来自肩胛—乌喙骨的内骨骼前胸突(prepectoral process)，因此是一个真正的胸棘片，与有棘类真节甲鱼的同名骨片性质相同。由此可推知，地质时代较晚的胴甲类的前腹侧片（anterior ventro-lateral plate, "claviculo-cleithral", 图 4d）是一复合骨片，由真正的胸棘片与前腹侧片（"ventral cleithral"）和内侧片愈合而成。这表明胴甲类起源于有棘类真节甲鱼的某些泥盆纪以前的类群。还可以进一步指出，与已知中、晚泥盆世胴甲类不同，云南标本中的后鳃板（postbranchial lamina, "anterior, internal transverse crest"; "apronic lamina"; cit_1, 图版 III:2；图 3a, b）的内侧部和整个腹部具有纹饰，由细小疣突组成的长脊构成。这些脊自上方和侧方向下方、中内方和略向前方延伸。真节甲类某些类群中后鳃板也有某种程度的纹饰。

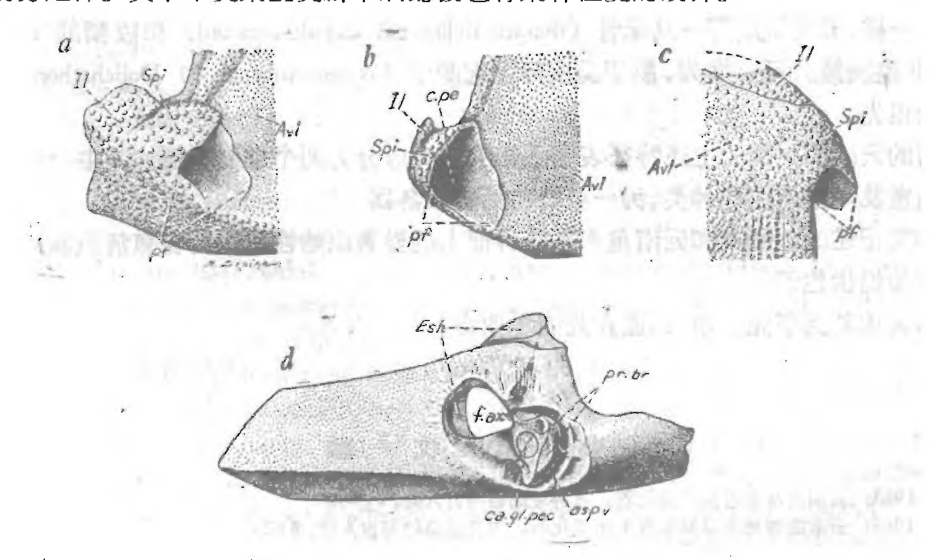


图 4. *a*—*c*, 云南胴甲鱼新种类左侧胸棘及胸窝侧视（*a*），后视（*b*）及腹视（*c*）；*d*, 加拿大沟鳞鱼右侧前腹侧片侧视，依 Stensiö 1959，图 20*B*；软骨由细点表示。

云南标本与中、晚泥盆世胴甲类的最显著差别表现在肩关节（axial joint）。肢突（brachial process）、腋窝（axial fossa）和腋孔（axial foramen）在星鳞鱼、沟鳞鱼(图 4d）和桨鳞鱼中发育甚好。云南标本完全不具上述构造，而具一位于胸棘片后方的深的胸窝（pectoral fossa, *pf*, 图版 IV:2—4；图 4a—c)。此窝在后开口处呈漏斗状展宽，前方和侧方被胸棘片、背方和腹方被从前腹侧片向侧方突出的外骨骼板（exoskeletal bone laminae）、中内方被前腹侧片上升的侧板（lateral lamina）所包围。侧板在胸窝前端被一孔洞穿（*c. pe*,

图版 IV:2; 图 4b)，胸鳍神经和血管由此孔自外骨骼肩带通出。由于包围胸窝的各个面均不具纹饰，亦无任何筛状骨组织构成的区域，此窝无疑由软骨充填，其后部与胸鳍内骨骼相关节。这一软骨可暂称为肩胛—乌喙骨的后侧部。胸窝内面或外面无任何肌肉附着的疤痕，表明胸鳍肌肉的起点在肩胛—乌喙骨的后侧部。可见肩胛—乌喙骨的这一部分似相当于 Coccosteomorphi 和 Dolichothoraci 等真节甲类肩胛—乌喙骨中支持胸鳍的整个部分(见 Stensiö 1959; Figs. 9—12, 57, 58)，因此比星鳞鱼、沟鳞鱼、桨鳞鱼等类群中充填肢突漏斗坑的关节软骨包含了更多的成分。

仅在 V4425.7 号标本中见到胸鳍的几块外骨骼骨片 (*El*, 图版 V:1)。从这些骨片可知，胸鳍肯定属于一般胴甲类的 monomesorhachic 型，但这些外骨骼骨片与地质时代较晚的已知胴甲类相比甚为短小。胸鳍无疑较小，未发育与外骨骼肩带的任何关节方式。在这一点上，云南标本的胸鳍比其他胴甲类的情况更为原始。

讨　论

综上所述，根据感觉沟系统、颊部骨片、特别是肩带、肩关节和胸鳍等方面的情况，胴甲类无疑起源于某些泥盆纪以前的有棘类真节甲鱼。后者和 Coccosteomorphi 及 Dolichothoraci 一样，具胸腹肩胛—乌喙骨 (thoraco-abdominal scapulo-coracoid) 和被鳞的 eumerosomatidial 型胸鳍。可以推测，胴甲类实际上起源于 Coccosteomorphi 和 Dolichothoraci 的共同原始祖先。

新的云南胴甲类的上述特征表明已知胴甲类应分为两个主要类群，其中一个类群包括云南鱼及与之有关的种类，另一类群包括其余各属。

本文记述的新种类和云南鱼在某些特征上的显著原始性可以为含鱼沉积属于早泥盆世的看法提供佐证。

本文承刘宪亭先生审阅，谨在此表示谢意。

(1980 年 2 月 29 日收稿)

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PRELIMINARY NOTE ON A LOWER DEVONIAN ANTIARCH FROM YUNNAN, CHINA[1]

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Introduction

In recent decades numerous vertebrates have been found in the Lower Devonian of the Yunnan Province, China, including a new antiarch, *Yunnanolepis chii*, which was described by Liu (1963; see also Liu 1965). Other antiarch remains from the Lower Devonian of Yunnan belong to another new form which will be dealt with in the present paper. This new form is probably akin to *Y. chii*, but not sufficiently well known to be properly defined. Thus the individual specimens described below will be referred to only by their registration number.[2]

Description

At a cursory glance the new antiarch bears general similarity to previously described forms. A closer examination, however, reveals several important differences, the most important ones of which will be enumerated below.

1. Premedian plate.

In the ordinary antiarchs the upper face of this plate (fig. 2b) is slightly convex in a rostro-caudal direction and slopes gently forwards. But in the Yunnan specimen V4424.3, where the head shield is well preserved, the corresponding face consists of two divisions (fig. 1d), a posterior concave division which is directed backwards and upwards, and an anterior slightly convex division which is directed forwards and upwards. These two divisions pass into each other along a mainly transverse ridge, somewhat angular in cross section, and both divisions are ornamented. As in the case of *Remigolepis* and probably also of certain other antiarchs of the ordinary type, the new form possesses no preorbital recess. Of interest is the fact that the premedian plate in specimen V4424.3 possesses a special, thick median ventral lamina (*r.spr*, Pl. I:2; fig. 1c,d), which, issuing from the median part of the anterior margin of the bone, extends backwards to a transverse plane at approximately the very front part of the orbital fenestra. This lamina could not be fully exposed in the available material, but it seems to have been in continuity with the inferior face of the premedian plate in such a way

1) This paper was written by the author in 1966 during her stay at the Swedish Museum of Natural History. It now appears in its original state although its publication has been delayed for more than ten years. Consequently, the references cited herein include only those that appeared before 1966.

2) Later, specimens V4424.3 and V4424.5 have been named as *Yunnanolepis parvus* and specimen V4425.7 as *Phymolepis cuifengshanensis* in Zhang Guorui's paper (1978, Vertebrata Palasiatica, **16**, 3).

as to form a broad median longitudinal osseous ridge, the subpremedian ridge. As pointed out below, it is possible that the ridge represents the anterior continuation of the internasal wall, thus consisting of endoskeletal bone tissue.

2. Rostral plate.

In specimen V4424.3, this plate (*R*, Pl.I:1; Pl.II:1; fig. 1a,e) may be regarded as composed of four laminae: dorsal, internasal, subnasal and prenasal (fig. 1e). The dorsal lamina is ornamented and consists of exoskeleton. The other three laminae are without ornament and, because of their position relative to the nasal openings and nasal cavities, may be assumed to be of an endoskeletal nature. The dorsal lamina alone corresponds to the rostral plate in the majority of other better known antiarchs. The internasal lamina is a vertical median formation between the posterior parts of the nasal cavities of both sides, and consequently this lamina is in fact a posterior part of the internasal wall. The subnasal lamina extends laterally to each side of the internasal one in such a way that it formed the floors of the posterior parts of the nasal cavities of both sides. Consequently this lamina is actually a part of the ventral wall of the ethmoidal region of the endocranium. The prenasal lamina forms the anterior, internal part of the rostral plate. It has a transverse position forming to some extent the anterior wall of each nasal cavity. However, it does not extend as far laterally as to form a complete anterior boundary to each of these cavities; its fairly limited lateral extension seems rather to indicate that the nasal capsule of each side stretches forwards and somewhat laterally along each side of the subpremedian ridge. Therefore, this ridge has such a position that it may well represent the anterior part of the internasal wall. In summary, we find that the rostral plate in specimen V4424.3 most certainly is a complex bone, consisting of both endoskeleton and exoskeleton. As may be readily gathered, the internasal and subnasal laminae of this bone seem to jointly represent the small Y-shaped bone previously recorded in *Bothriolepis* and *Remigolepis* (Pattern 1912, é, fig. 253; Stensiö 1931, p.27, 1948, pp.25—26). The endoskeletal Y-shaped bone in *Bothriolepis* and *Remigolepis* is separated from the exoskeletal rostral plate and is much less developed than that in specimen V4424.3. In that specimen, consequently, the endocranium seems to have been more extensively ossified than it was in either *Bothriolepis* or *Remigolepis*.

3. Sensory line system of the head.

In this respect specimen V4424.3 is essentially as the previously known antiarchs except in following details.

The anterior, upwards and forwards directed division of the dorsal face of the premedian plate bears an upwards and backwards curving groove which may correspond to the median part of the ethmoidal commissure proper between the infraorbital lines of both sides (*ifc.eth.c*, Pl. I: 1; Pl. II: 1; fig. 1a, e). If this be so, it is clear that, after crossing the mental plate of each side, this sensory line commissure extends upwards on to the premedian plate, the anterior median part of which hence would comprise scale elements corresponding to those of the rostral series of tesserae in the Rhenanida (Stensiö 1969, *Sc. r*, figs. 93—98). In the case of specimen V4424.3, the secondary, superior suborbital branch of the infraorbital line (see Stensiö 1969; "the suborbital anterior branch": Stensiö 1947; "the upper infraorbital sensory line": Stensiö 1948), which is present in the previously described antiarchs, is either absent or

occupies an entirely superficial position.

No groove for the preopercular sensory line was previously found in the Middle and Upper Devonian antiarchs (fig. 2a). However, such a groove occurs in specimen V4424.3 (*poc*, Pl. I: 1; Pl. III: 1; fig. 1a). From a point near the suture between the paranuchal and the dorsal preopercular ("postmarginal") this groove runs laterally and downwards across the latter bone, just as in the Pachyosteomorphi, Dolichothoraci and Coccosteomorphi. Actually, the preopercular sensory line in the Yunnan specimen just referred to has essentially the same position and orientation as shown by Stensiö in a hypothetical reconstruction published about 20 years ago (Stensiö 1947, fig. 14B). The presence of the groove under discussion shows that the two paired postero-lateral bones of the exoskeletal skull roof in the antiarchs have been correctly interpreted by Stensiö as a paranuchalo-marginal and a dorsal preopercular ("postmarginal"), respectively.

4. Dermal bones of the cheek.

A single extralateral or opercular plate, similar to that in ordinary antiarchs, is not met with in the new form from Yunnan. In specimen V4424.3 one finds instead, in much the same position relative to the skull-roof as that plate in *Bothriolepis*, and occupying about the same area as the latter, a complex of three plates. Of these, the anterior one (*Sb*, Pl. I: 2; Pl. III: 1) seems to correspond to the hindmost part of the suborbital in e.g. the Pachyosteomorphi, Coccosteomorphi and Dolichothoraci, whereas the other two (*Pso*, Pl.I:2; Pl.III:1; *Sm*, Pl.III:1) may represent the postsuborbital ("ventral preopercular") and the submarginal ("internal"; "middle preopercular") of those euarthrodires where the dermal bones of the cheek still persist to full extent. However, since the suture between them is obscure for the most part, the latter two bones probably have fused to some extent.

5. Cervical joint.

As in other antiarchs, the exoskeletal division of the cervical joint of each side in the new Yunnan form consists of a trochlea on the exoskeletal skull roof and a fossa on the exoskeletal shoulder girdle. The trochlea (*pnt*, Pl.IV:1; fig.1b) extends along the entire posterior margin of the paranuchalo-marginal plate. It has a horizontal position and is highest at its medial end and lowest at its lateral. A distinctive character of this trochlea is, however, that its articular area is divided throughout into two divisions, superior and inferior, by a pronounced horizontal groove (*a.s, a.i, gr*, Pl.IV:1; fig.1b). The two divisions consists of cribriform bone whereas the bottom of the groove separating them is formed by ordinary bone tissue. For the purpose of comparison, it may be mentioned that the articular area of the trochlea in *Bothriolepis* is practically a continuous formation, whereas in *Asterolepis* it is subdivided into several minor areas separated by more or less irregular vertical and obliquely horizontal grooves. In the present case, the articular fossa has its ordinary position on the anterior margin of the anterior dorso-lateral ("posttemporal") plate. As this fossa corresponds to the trochlea, its articular area is also divided into superior and inferior divisions by a horizontal groove.

6. Shoulder girdle and pectoral fin.

The exoskeletal shoulder girdle in the specimens now under consideration (Pl. III:

2—4; fig. 3a-d) is of the ordinary type characteristic of the Middle and Upper Devonian antiarchs, except that in specimens V4424.3, V4424.5 and V4424.20 there are clear traces not only of a separate intero-lateral plate ("clavicle") (*Il*, Pl. I: 2; Pl. III:4; Pl.IV:2,3; Pl.V:2,3; fig. 3d; fig. 4a-c) but also of a spinal plate in it. The spinal plate (*Spi*, Pl. III: 2—4; Pl. IV: 2—4; Pl. V: 2; fig. 3a-d; fig. 4a-c) contains an internal cavity opening inwards into the interior of the exoskeletal shoulder girdle, which indicates that it housed an endoskeletal prepectoral process issuing from the scapulocoracoid and that, moreover, it is a true spinal plate of the same nature as the similarly termed bone in the spinothoracid euarthrodires. Consequently, it can now be inferred that the anterior ventro-lateral plate ("claviculocleithral") in the geologically younger antiarchs (see fig. 4d) is a complex bone which has arisen by the fusion of a true spinal plate with the anterior ventro-lateral ("ventral cleithral") and intero-lateral plates. This means that the Antiarchi were derived from some pre-Devonian group of spinothoracid euarthrodires.

It may be further pointed out that, unlike in the better known Middle and Upper Devonian antiarchs, the intero-lateral and the entire ventral part of the post-branchial lamina ("anterior, internal transverse crest"; "apronic lamina"; cit_1, Pl. III: 2; fig. 3a,b) are ornamented with long ridges consisting of fine tubercles. The ridges run from above and laterally in a direction downwards, medially and somewhat forwards. The postbranchial lamina is also ornamented to a varying degree in several groups of euarthrodires.

The most striking difference between the Yunnan specimens and all the better known Middle and Upper Devonian antiarchs is found in the axial joint. The brachial process, the axial fossa and the axial foramen which are well developed in such forms as *Asterolepis, Bothriolepis* (see fig. 4d) and *Remigolepis*, are entirely absent in the Yunnan specimens, which possess instead a deep *pectoral fossa* (*pf*, Pl. IV: 2—4; fig 4a-c) situated morphologically posterior to the spinal plate. This fossa, which widens funnel-like towards its posterior opening, is bounded anteriorly and laterally by the spinal plate, dorsally and ventrally by exoskeletal bone lamina projecting laterally from the anterior ventro-lateral plate and medially by the ascending, lateral lamina of the same plate. At the anterior end of the fossa this latter lamina is pierced by a wide canal (*c.pe*, Pl.IV:2; fig. 4b), through which the nerves and blood vessels of the pectoral fin emerged from the exoskeletal shoulder girdle. Since all the faces surrounding it lack ornament and do not show any areas made up of cribriform bone tissue, the pectoral fossa just described was surely filled with cartilage, against the posterior side of which the endoskeleton of the pectoral fin articulated. This cartilage may be provisionally referred to as the posterolateral part of the scapulo-coracoid. There are no signs of any muscle scars either within or outside the pectoral fossa, and this shows that the musculature of the pectoral fin took its origin on the postero-lateral part of the scapulo-coracoid. Consequently, that part of the scapulo-coracoid seems to have corresponded to the entire finbearing part of the scapulo-coracoid in such groups of euarthrodires as, for example, the Coccosteomorphi and Dolichothoraci (see Stensiö 1959, figs. 9—12, 57, 58); it was hence more comprehensive than the glenoid cartilage filling the funnel pit of the brachial process in *Asterolepis, Bothriolepis, Remigolepis* and other forms (see Stensiö 1959, figs. 20, 22, 23).

Of the pectoral fin, only a few exoskeletal plates, have been found in specimen

V4425.7 (*El*, Pl.V:1). As can be seen from these plates, the pectoral fin was decidedly of the monomesorhachic type, i.e., of the ordinary antiarchian type, but its exoskeletal bone plates are much shorter and smaller than those of the better known, geologically younger antiarchs. The fin itself was surely of rather small size, not having acquired any articulation against the exoskeletal shoulder girdle itself. In this particular respect it was therefore at a more primitive stage than the corresponding fin in the other antiarchs.

Discussion

On the basis of what has been set out above we find that, so far as the sensory line system, cheek bones and particularly the shoulder girdle, axial joint and pectoral fin are concerned, the antiarchs have surely evolved from some pre-Devonian spinothoracid euarthrodires which, like the Coccosteomorphi and Dolichothoraci, possessed a thoracoabdominal scapulo-coracoid and a eumerosomactidial pectoral fin covered with scales (see Stensiö 1959). It is not inconceivable that they were, in fact, derived from the common primitive ancestors of the Coccosteomorphi and Dolichothoraci.

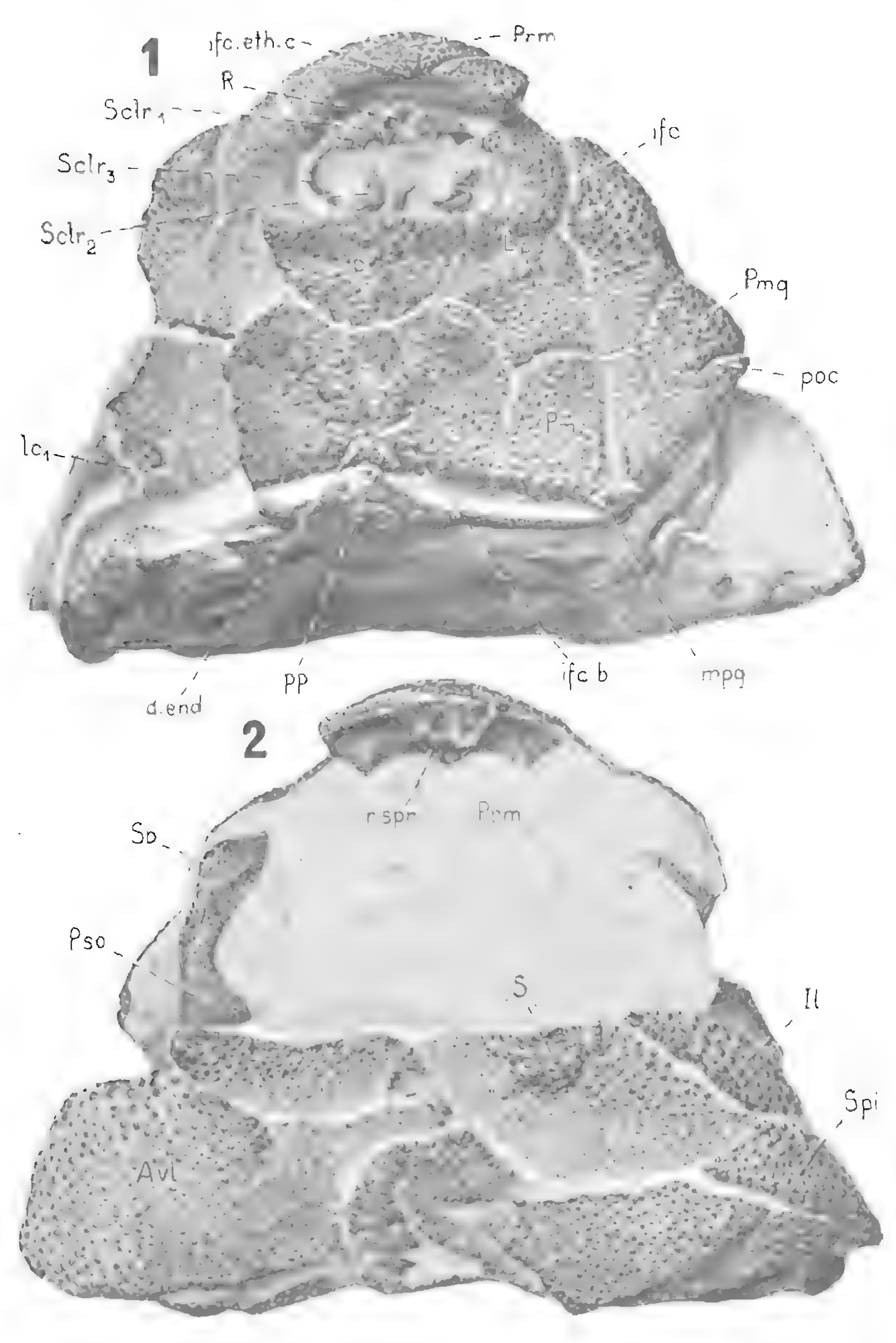
All the above-mentioned characters of the new Yunnan antiarch show that the antiarchs so far known should be classified into two principal groups: one including *Yunnanolepis* and related forms, the other including the remaining genera.

The circumstance that in several characters the new form described here and *Yunnanolepis* are both strikingly primitive seems to corroborate the opinion that the deposits in which these forms occur are of a Lower Devonian age.

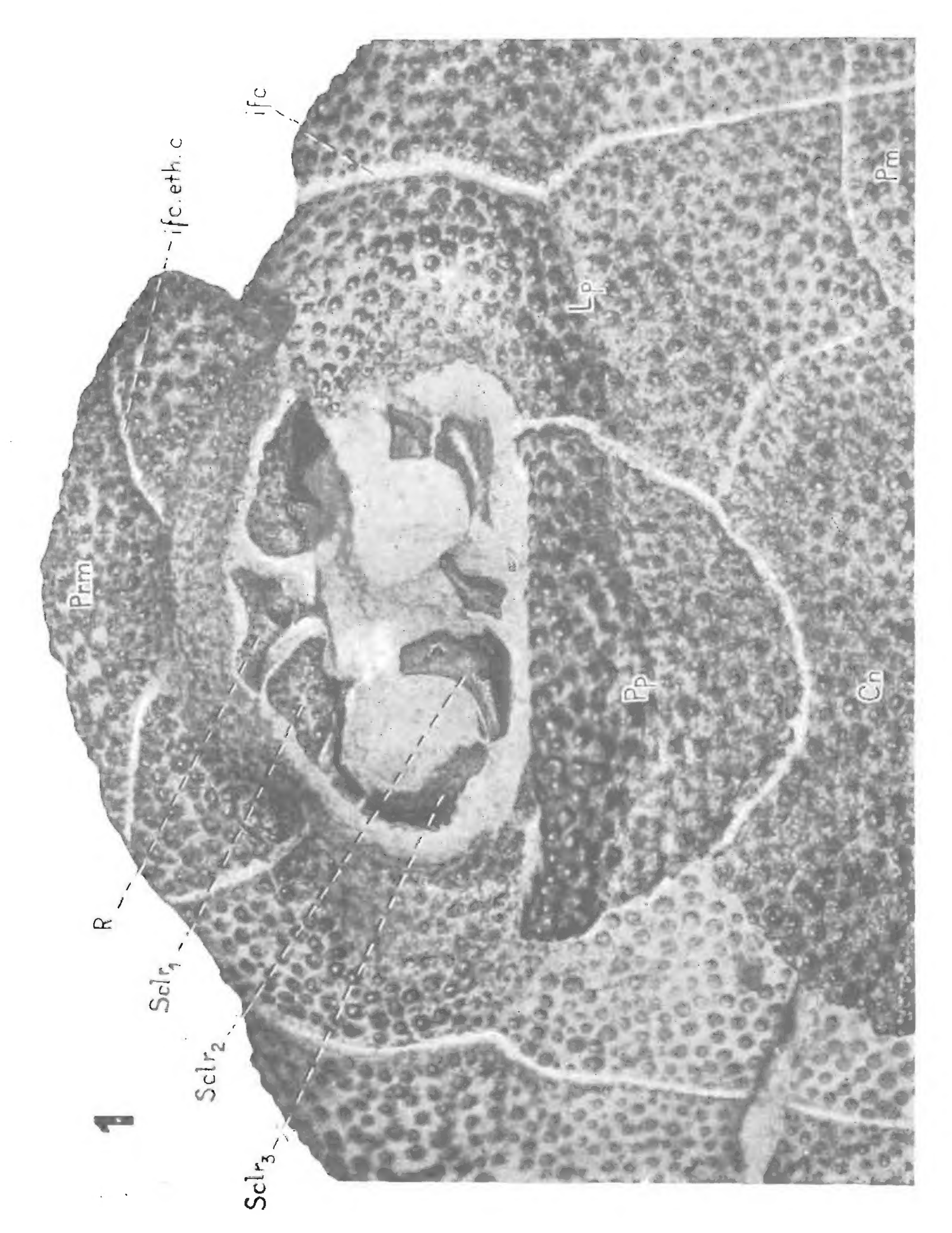
The present study was carried out in the Section of Palaeozoology, Swedish Museum of Natural History, Stockholm in 1966. The author is deeply grateful to Professors E Stensiö, E Jarvik and T Ørvig for their advice and help and for their generous hospitality. The author also wishes to express her thanks to Mr U Samuelson who prepared the photographs and to Mrs Milda Liepina who made the text-figures and retouched the photographs.

图版及插图简字说明

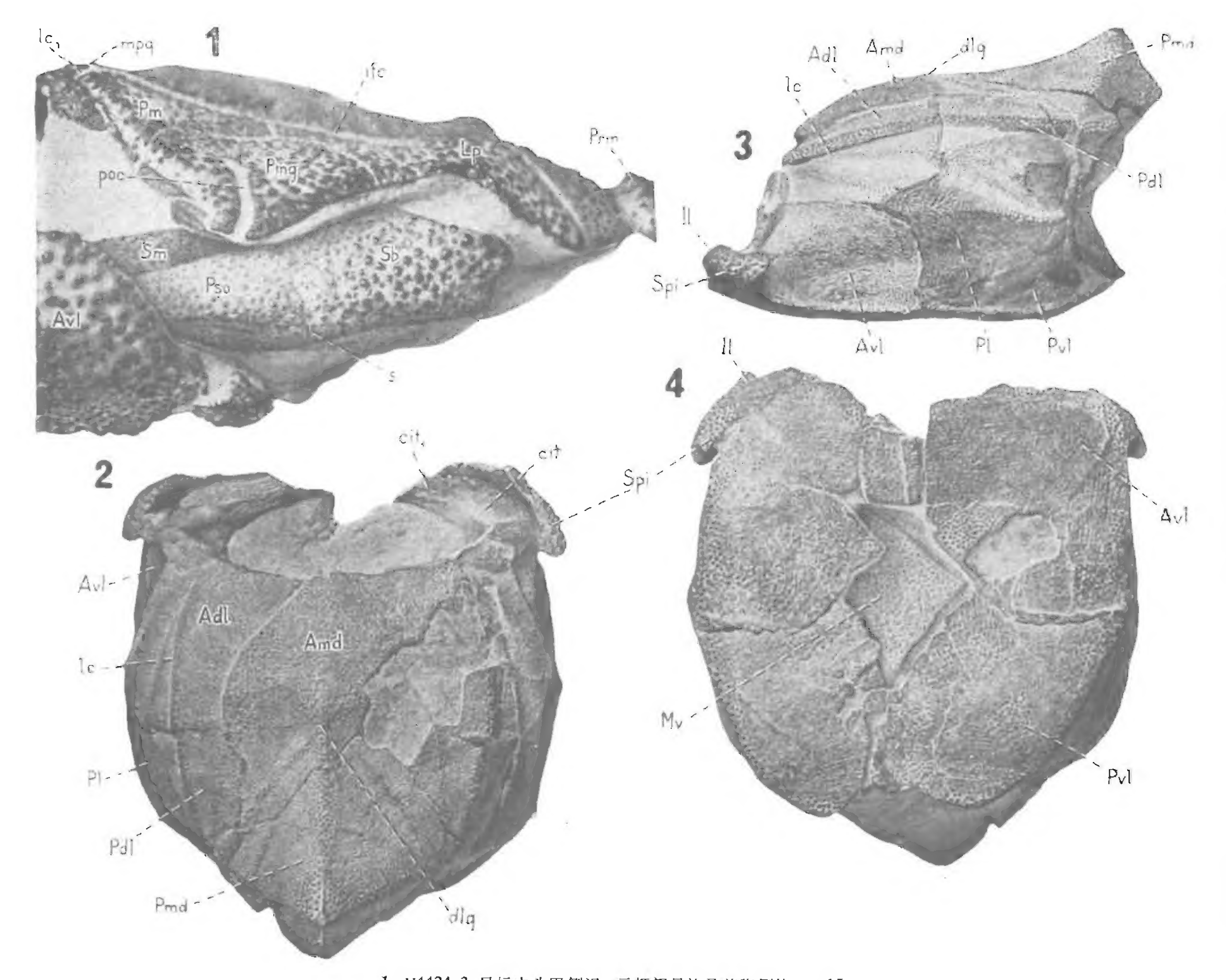
Adl anterior dorso-lateral plate ("postemporal") 前背侧片("后颞片")
Amd anterior median dorsal plate 前中背片
Avl anterior ventral-lateral plate 前腹侧片
Cn centro-nuchal plate 中颈片
El exoskeletal plates of pectoral fin 胸鳍外骨骼骨片
Esh scapulo-coracoid 肩胛-乌喙骨
Il intero-lateral plate ("clavicle") 内侧片("锁骨")
Lp lateral plate 侧片
Mv median ventral plate 中腹片
Pdl posterior dorso-lateral plate 后背侧片
Pi pineal plate 松果片
Pl posterior lateral plate 后侧片
Pm paranuchalo-marginal plate 副颈缘片
Pmg dorsal preopercular plate ("postmarginal") 背前鳃盖片("后缘片")
Pp postpineal plate 后松果片
Prm premedian plate 前中片
Pso postsuborbital plate (corresponding in part to an extralateral plate or "opercular") 后下眶片
Pvl posterior ventro-lateral plate 后腹侧片
R rostral plate 吻片
S semilunar plate 半月片
Sb suborbital plate (corresponding in part to an extralateral plate or "opercular") 下眶片
$Sclr_1$, $Sclr_2$, $Sclr_3$ anterior, postero-dorsal and postero-ventral sclerotic plates 前、后背及后腹巩膜片
Sm submarginal plate 下缘片
Spi spinal plate 胸棘片
a.i, *a.s* inferior and superior articular area of paranuchal trochlea 副颈片滑车下、上关节区
aspv precondylar space of brachial process 肢突髁前窝
c. pc canal piercing anterior ventro-lateral plate at the end of pectoral fossa 胸窝前端穿过腹侧片的孔
ca. gl. pec glenoid cartilage 关节软骨
cav.n nasal cavity 鼻腔
cir semicircular pit-line groove 半环形凹线沟
cit, cit_1 lateral vertical and ventral horizontal divisions of crista transversalis 前内横脊的侧面垂直部分及腹面水平部分
cv. cranial cavity 颅腔
d. end external opening for the ductus endolymphaticus 内淋巴管外孔
dlg posterior oblique abdominal pit-line groove 后斜腹凹线沟
f.art articular fossa for paranuchal trochlea 副颈片滑车关节窝
f.ax axial foramen 腋孔
fe.exn.c fenestra exonarina communis 联合外鼻孔
gr groove on the posterior face of paranuchal trochlea 副颈片滑车后面的沟
ifc infraorbital sensory line 眶下感觉沟
ifc.b posterior oblique cephalic pit-line groove ("central sensory line") 头部后斜凹线沟
ifc. eth. c ethmoidal commissure of infraorbital lines of both sides 两侧眶下感觉沟的筛联合
la. inn, *la. prn*, *la.sbn* internasal, prenasal and sub-nasal lamina 鼻间板,鼻前板,鼻下板
lc main lateral line 主侧线
lc_1 cephalic division of main lateral line 头部主侧线
mpg middle pit-line groove 中凹线沟
pf pectoral fossa 胸窝
pnt paranuchal trochlea 副颈片滑车
poc preopercular sensory line 前鳃盖感觉沟
pp posterior pit-line groove 后凹线沟
pr.br brachial process 肢突
prh, prh_1 median unpaired and lateral paired divisions of preorbital recess 眶前凹中部及侧部
pr.r probable cartilaginous rostral process formed by the inferior part of the ethmoidal region 可能由筛区下部构成的软骨吻突
r. spr subpremedian ridge 下前中脊
s suture between suborbital and postsuborbital plates 下眶片与后下眶片之间的骨缝
stc supratemporal pit-line groove 上颞凹线沟



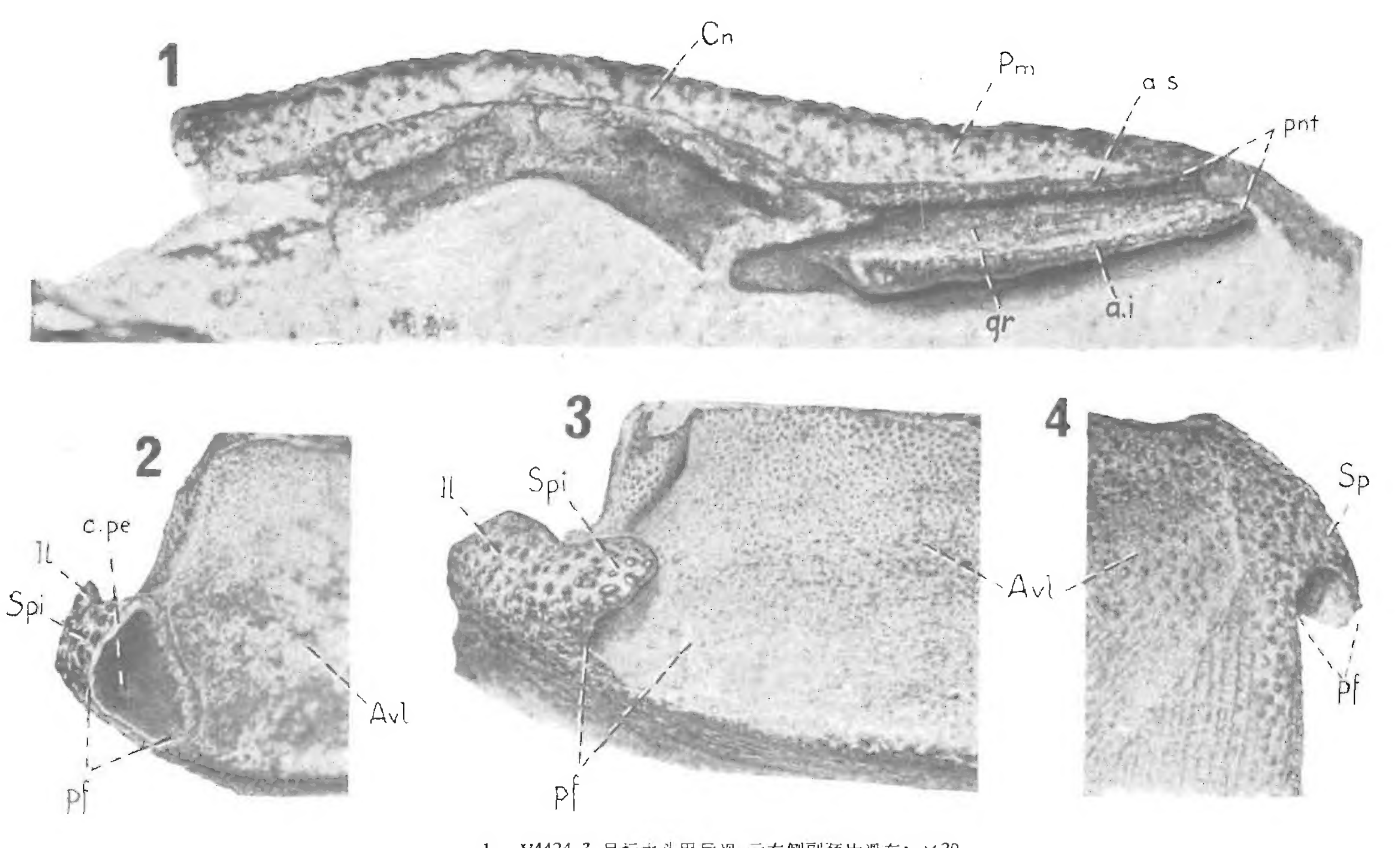
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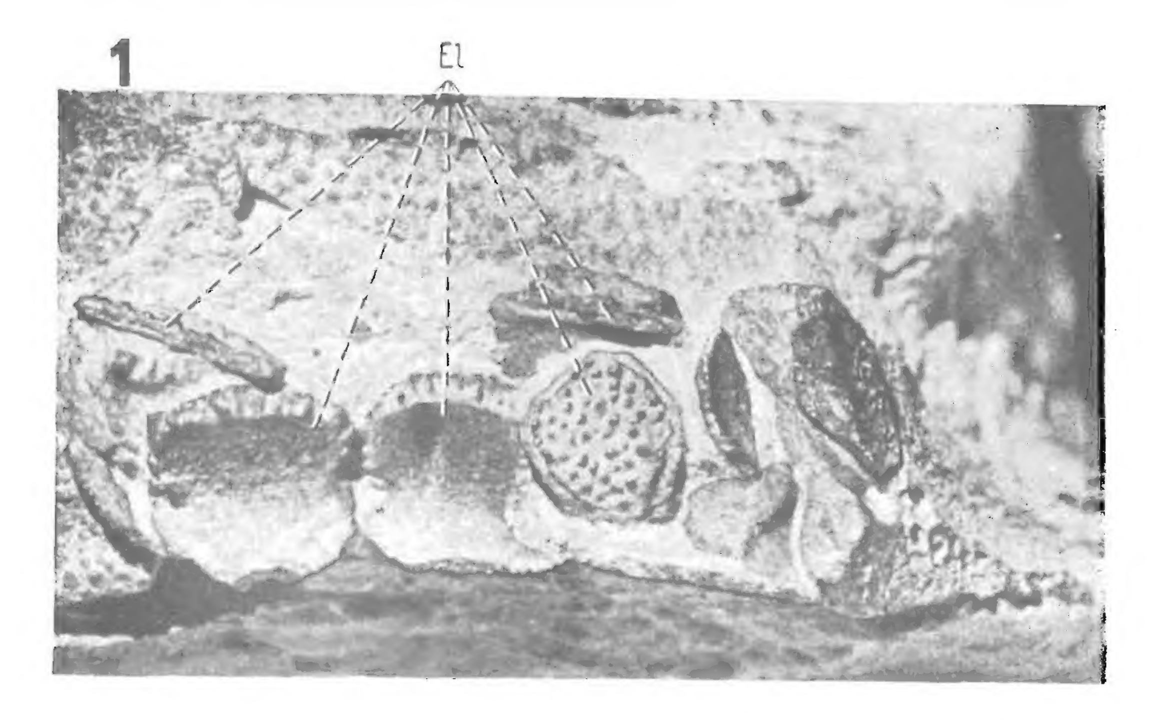
V 4424.3 号标本头甲前部背视；×25。

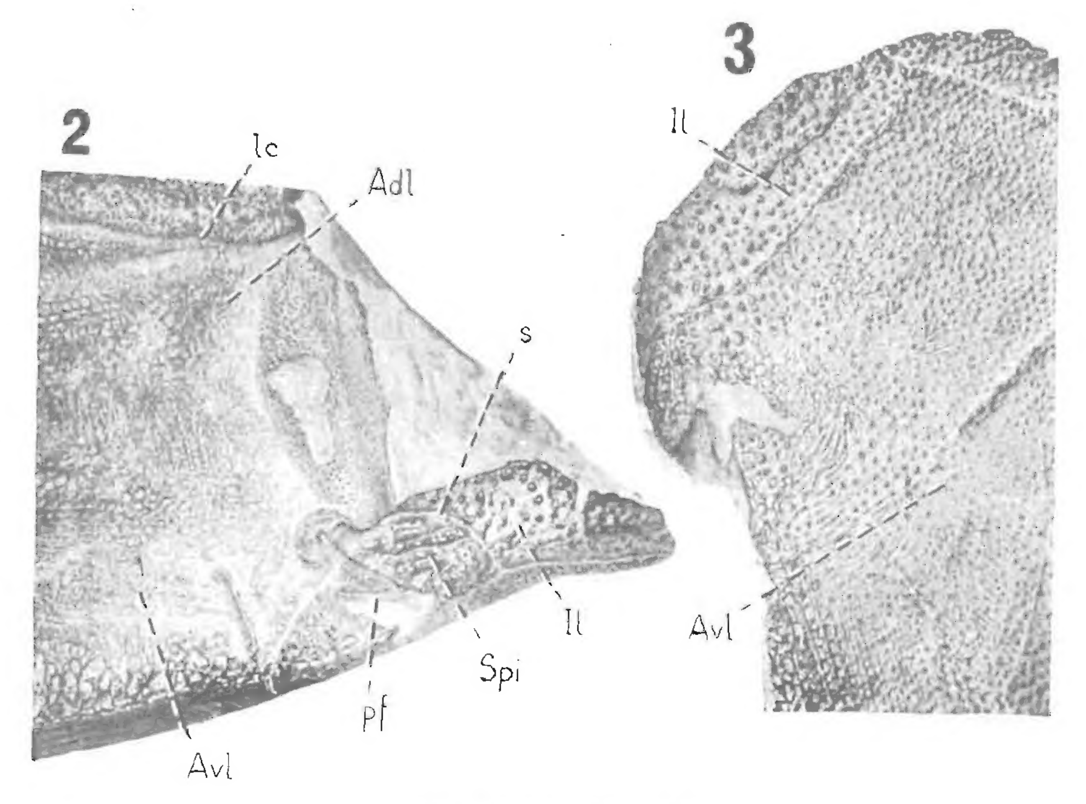


1. V4424.3 号标本头甲侧视，示颊部骨片及前腹侧片：×15。
2—4, V4424.20 号标本躯甲背视(2)，侧视(3)及腹视(4)：×4。



1. V4424.3 号标本头甲后视,示右侧副颈片滑车: ×20。
2—4, V4424.20 号标本: 胸棘及胸窝后视(2),胸棘侧视(3)及腹视(4); ×10。





1．V4425.7 号标本右侧胸鳍外骨骼骨片；×15。

2,3，V4424.5 号标本：躯甲前侧部侧视(2)，示内侧片及胸棘片间骨缝；躯甲前侧部腹视(3)，示内侧片及前腹侧片间骨缝；×8。